A DISSERTATION ON

# "ROYAPETTAH SCORING SYSTEM" - A FUNCTIONAL ASSESSMENT OF ORAL CANCER RESECTION

**SUBMITTED TO**

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# BONAFIDE CERTIFICATE

This is to certify that **Dr.M.RAMESH** bonafide student of M.Ch., Surgical Oncology (June 2003 to February 2006) in the Department of Surgical Oncology, Govt. Royapettah Hospital, Chennai-600014, has done this dissertation on **"ROYAPETTAH SCORING SYSTEM" - A FUNCTIONAL ASSESSMENT OF ORAL CANCER RESECTION** under my guidance and supervision in partial fulfillment of the regulations laid down by The Tamilnadu Dr.M.G.R.Medical University, Chennai, for M.Ch. Surgical Oncology Examination to be held in February 2006.

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# CONTENTS

# INTRODUCTION

Head and Neck cancer is one of the most common cancers in our country and Oral cavity is the commonest site among these cancers constituting 30 % of the total. Nearly half of the patients are in locoregionally advanced stage at the time of presentation. This same trend prevails in our hospital also. Mortality in Head & Neck cancers is mostly due to uncontrolled locoregional disease. Therefore control of locoregional disease becomes the cornerstone of treatment in such patients which involves multimodal approach in the form of Surgery and Radiotherapy. Surgery often has to be extensive in nature with Radiotherapy added preoperatively most of the time. This extensive resection needs complex reconstructive procedures. Hence the resultant morbidity is not only from the disease itself but also significantly from the consequences of these aggressive treatments

Head and Neck region, the most important part of the body cosmetically, is also the sheet anchor of important basic functions of life like chewing, swallowing and speech. Surgery often results in acceptable to devastating morbidities in terms of function and cosmesis. The affected functions are mouth opening, oral competence, occlusion, speech and swallowing. The role of oncological care does not stop with surgery alone but involves the effective rehabilitation of these functional problems thereby improving the quality of life. Nowadays the outcome of treatment is not only assessed with over all survival

and Disease Free interval but also with assessment of Quality of life (QOL) following treatment. Hence outcome of treatment of oral cancer with good survival but without acceptable functional outcome is meaningless.

Now microvascular reconstructive procedures, osseointegrated implants and improved prosthesis have reduced the morbidity to a great extent. But most important result is the post operative functional rehabilitation which requires dedicated multidisciplinary team. To plan and focus the rehabilitative measures it is important to accurately assess the type and degree of impairment.

The available tests to assess the functions like speech and swallowing are time consuming; costly; needs technical experts, not available everywhere and have poor patient compliance. Right now there is no universally acceptable clinical assessment system.

Our patients belong largely to low socio economic group with poor intelligence and come from places which are far away. With this background we devised this simple scoring system based on clinical methods to assess the functional outcome which can be applied in the outpatient department itself.

# AIMS OF THE STUDY

- To evolve a simple assessment system for assessing the functional outcome of oral cancer resection based on clinical methods which can be applied at the Outpatient department itself
- To assess the psychosocial impact of the Morbidity.
- To assess the correlation of functional impairment to the type and extent of resection.
- To assess how the patient adapts to the impairment over the period of time.
- To assess the priority of Rehabilitation needs.
- To assess the reconstructive efficacy of our surgery.
- And ultimately assessing the over all quality of life following Surgery and how this scoring system is useful in our setup and our set of patients

# MATERIALS

It is a prospective study during the period between 2000 January to 2004 December. Patients with oral cancers with out distant metastasis who underwent different types of oral resections and reconstructions were included in the study. This includes those who received Preoperative RT also. Patient who developed recurrence were excluded from the study. Similarly those who are not coming for follow up regularly during one year also excluded.

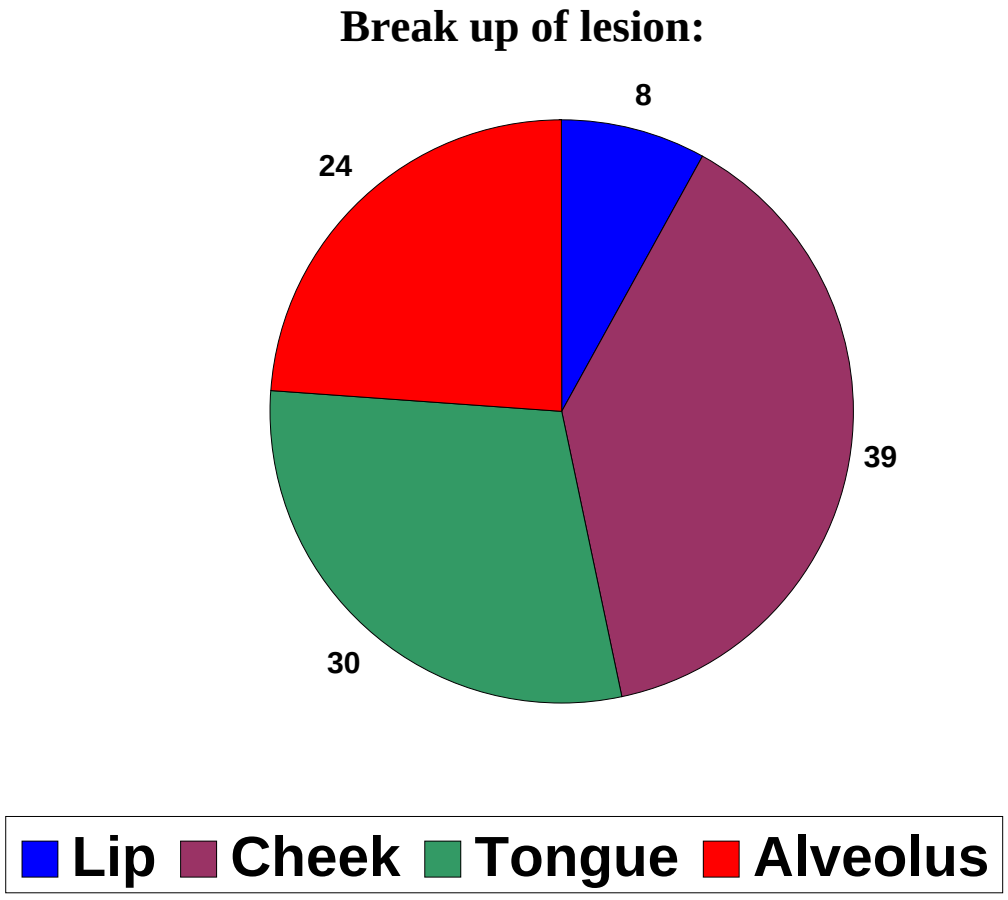
Patient with resection extending to oropharynx and supraglottic larynx also excluded from the study. Patient with flap failure and patient who underwent immediate recorrection also excluded.

Total number of cases during this period is 101

# METHODS

Patients were taken up for surgery after metastatic workup. Extent of resection and type of reconstruction were planned in the preoperative planning session after getting consent from the patients.All the patients were thoroughly counselled about the morbidity in terms of function and the need for rehabilitative training and regular follow-up.

Dental care and mouth hygiene taken care off by the dentist when the patients are planned for pre operative RT



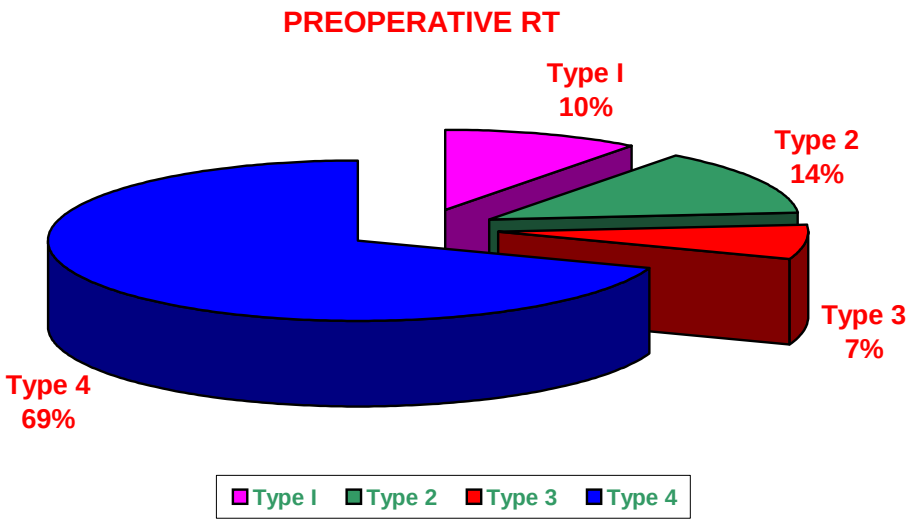
We have devised a classification of Resection based on the impairment of function it produces.

| Types | Resection | Impairment |
|---|---|---|
| I | Cheek , Lip | Oral competence |
| II | Maxilla, Mandible | Speech, Occlusion |
| III | Tongue/And floor of mouth | Speech, Swallowing |
| IV | Combined | Combination |

**No. Cases studied between 2000- 2004: 101**

| | | |
|---|---|---|
| Type I Resection (Cheek , Lip ) | 15 | 14.85% |
| Type II Resection ( maxilla, mandible) | 14 | 13.86% |
| Type III Resection (Tongue) | 12 | 11.88% |
| Type IV Combined | 60 | 59.40% |

**Preop RT:**



**Reconstruction:**

We have done reconstruction in all cases except in Type III resection where wide local excision of tongue or hemiglossectomy done with primary closure .These procedures were done in lesions limited to the tongue without involving the floor of mouth.

Flaps used are:

Pectoralis Major Myocutaneous Flap

Fore Head Flap

Nasolabial Flap

Deltopectoral flap

wide excision and split skin grafting done in select cases of cheek lesion. Reconstruction with Pectoralis Major Myocutaneous flap and Deltopectoral flap were done for composite resection and Fore head flap and Nasolabial Flap were used for cheek and lip reconstruction.

Microvascular free flaps are not routinely done in our centre.

Following are the parameters taken for assessment.

1. **Pain**
2. **Mouth Opening**
3. **Oral Closure**

4. **Occlusion**
5. **Swallowing**
6. **Speech**
7. **Cosmetic/Social acceptance**

Each function is given a score ranging from 5 to 0 depending on the impairment. A score of 5 means excellent and 0 meaning poor result.

Assessment is done by interacting with the patient, and sometimes with the attendant and by observing the acts of swallowing, mouth opening, closure and speech.

Functional assessment done at the time of discharge when the wounds have healed completely, after 3 months and at the end of one year

For example pain is assessed as follows

No pain - Excellent (5)

Rare pain – Good (3)

Modest -Fair (1)

Severe pain – poor (0)

Similarly each function is assessed and is given in the following Table in detail

# Royapettah Scoring System

| Ratings | Excellent(5) | Good(3) | Fair(1) | Poor(0) |
|---|---|---|---|---|
| Pain | Nil | Rare | Modest | Severe |
| Mouth Opening | Normal | Trismus + | Trismus + + | Trismus +++ |
| Oral Closure | Blows | Holds Food | Rare Spill | Drooling of Saliva |
| Occlusion | Hard Bite | Chews Solid | Soft Solid | Liquid Only |
| Swallowing | Normal | Avoids certain food | Regurgitation | Aspiration |
| Speech | Normal | Few Syllables | Audible | Not Audible |
| Cosmetic/Social Acceptance | Resumes Work Enthusiastically | Adapts to Work | Socializes & Accepts | Confines and Dislikes |

Thus the maximum scoring we get is 35. A score of less than 17 is taken as poor result. One year score is taken as final one and further treatment is planned accordingly, (Because local recurrence is common within one year). Outcomes of surgery are divided based on the total scoring as follows

| | |
|---|---|
| Excellent | >30 |
| Good | 25-30 |
| Fair | 17-24 |
| Poor | <17 |

# ANALYSIS

The analysis is done function wise

## ORAL CLOSURE/ORAL COMPETENCE

Oral closure /Oral competence is the commonly affected function in our series. In cases reconstructed with nasolabial flap minimal impairment with good outcome were noticed whereas in fore head reconstruction the results were Good to Fair outcome. Composite resection resulted in fair to poor outcome in the form of spilling of food and drooling of saliva. Most patients with food spill adapted to the condition and improved over time whereas patients with drooling of saliva found it very difficult to adapt. These patients were advised flap revision after one year. But only 15 % of patients accepted and underwent flap revision

## CHEWING/OCCLUSION

Chewing/occlusion is the most severely affected as almost 60 % of patient underwent composite resection where one hemimandible is removed. Hard bite is completely affected

(Marginal and segmental mandibulectomy not routinely done as most patient are presenting with advanced lesion and 73 % patients of composite resection received preop RT)

Chewing is worst affected where both maxilla and mandible were removed and also in resection of mandible extending to mentum. But most patients were able to chew solid food with opposite side. Some patients modified their food habits.

**SPEECH**

Speech impairment was more pronounced in composite resection group where hemiglossectomy or total glossectomy is included in the resection. It is also high in groups of people who underwent palatoalveolar excision and maxillectomy.

**SWALLOWING**

Swallowing is also affected in all cases from minimal degree to a greater extent except in Type I resection. Patient who underwent wedge resection of tongue or Hemiglossectomy had swallowing difficulty but all patients improved very well over a period of time. Swallowing is affected more when the floor of mouth was also included in the resection.

**COSMESIS AND SOCIAL ACCEPTANCE**

Cosmetic outcome is fair to poor in our series because of our handicaps in reconstruction. Microvascular free flap not done routinely, segmental and

marginal mandibulectomy are rarely done in view of advanced lesion and preoperative RT in most cases.

In spite of cosmetic disfigurement, social acceptance is very high in our patient group. Only three patients complained very much about the cosmesis and confined themselves to home.The increased acceptance is being due to the rural background and low socioeconomic status.

Obviously Functional impairment were more in composite resections and who received pre operative RT especially in composite resection group.

Some kind of Improvement in these impairments is noticed in all patients during the follow-up. All patients are painless after one year. But mouth opening is progressively deteriorated in spite of effective rehabilitative training in about 22% of patients .All these patients have received Preoperative RT.

Swallowing and chewing were all very well improved by rehabilitative training and patients adaptation. Speech also improved in patients who are educated and motivated and those who regularly attend speech therapy.

In our series we had following results.

| | |
|---|---|
| Excellent | 11.76% |
| Good | 41.8% |
| Fair | 28.22% |
| Poor | 18.87% |

Surgical correction in the form of flap revision and contraction release were done for oral incompetence and microstomia respectively after one year.

# CONCLUSION

The criteria we have laid down for the extent of impairment is simple and clear to follow with minimal bias between the observers. Patient compliance is also very good for this assessment

**MERITS OF THE SYSTEM**

- Simple
- Easy Applicability
- Quick Assessment
- Done at the Outpatient Department itself
- No investigations and Good patient compliance

Therefore our Royapettah Scoring system is a simple clinical and cost effective method. It gives an effective assessment of functional outcome in our series of patients and we plan rehabilitation therapy based on that and found it very useful to our patients.

**FUTURE**

It needs to be compared with established functional tests and scoring systems to assess the impairment. Preoperative functional scoring should also be done by same system and compared with the Post operative one. This system has to be evaluated separately for similar type of resection and patients of similar intelligence.

# PROFORMA

Name: Age/Sex:

Address

IP NO. : CD No.:

DOA : DOS : DOD :

Site of Lesion :

Stage of Lesion :

HPE :

Previous Treatment :

Surgery :

Radiotherapy : EBRT

Brachytherapy

Pre Operative Treatment in our Hospital

EBRT

Brachytherapy

Surgery : Type of Resection :

Type of Reconstruction :

Whether Neck dissection Combined :

Duration of Hospital Stay :

Wound Healing :

Post op. HPE :

Post op. Adjuvant Treatment :

Functional Assessment

**At Discharge**

| Function | Score |
|---|---|
| Pain | |
| Mouth Opening | |
| Oral Closure | |
| Occlusion | |
| Swallow | |
| Speech | |
| Social Acceptance & Cosmesis | |
| **Total** | |

**At 3 Months**

| Function | Score |
|---|---|
| Pain | |
| Mouth Opening | |
| Oral Closure | |
| Occlusion | |
| Swallow | |
| Speech | |
| Social Acceptance & Cosmesis | |
| **Total** | |

**At One Year**

| Function | Score |
|---|---|
| Pain | |
| Mouth Opening | |
| Oral Closure | |
| Occlusion | |
| Swallow | |
| Speech | |
| Social Acceptance & Cosmesis | |
| **Total** | |

Final outcome at one year. :

Revision Surgeries for Impairment :

# LITERATURE REVIEW

## INTRODUCTION

The cosmetic, functional, and psychosocial results of oral cancer treatment may combine to produce devastating effects on patients, especially if the tumor is extensive or the treatment particularly aggressive. Indeed, oral cancer is noted for the toll it exacts from patients, from both the disease itself and the effects of its treatment. A variety of functions can be affected, including speech, deglutition, management of oral secretions, and mastication. . Most of these patients required to be rehabilitated at major teaching institutions or designated cancer centers that include a multidisciplinary team as their treatment may result in loss of oral functions and cosmetic deformities.

With recent changes in the modalities of cancer treatment and reconstruction (e.g., the introduction of brachytherapy and microvascular free flap transfers), rehabilitation of the oral tissues takes on a new dimension. Conventional maxillofacial prosthetic rehabilitation usually will not be enough to restore the resultant hard or soft tissue defects. Thus, a multidisciplinary surgical team that includes dentists will increasingly be instrumental in the reconstruction of head and neck patients. The ultimate goal of rehabilitation, however, will remain the restoration of oral functions and cosmesis with the aim of providing an acceptable quality of life.

Successful rehabilitation and quality of life go hand in hand. Because patients vary in attitudes and adaptation, it is very difficult to predict the patient's eventual quality of life prior to initiating treatment for an oral tumor. Furthermore, the use of newer techniques at surgical reconstruction makes the maxillofacial prosthodontist's task even more challenging. It is important for the dental team to be experienced and to identify for the medical and surgical oncologists realistic goals and objectives for rehabilitation. At major cancer centers with rehabilitative teaching programs, it is not uncommon for the surgically resected head and neck patient to require 20-25 appointments for appropriate rehabilitative care in a 1-year period.

With multidisciplinary cancer therapy (ablative surgery, reconstructive surgery, radiation therapy, and/or chemotherapy) available, rehabilitative dentistry is essential for improving quality of life. Treatment plans for rehabilitative dentistry should be included in the overall cancer treatment plan; in many instances, the sequelae of ablative head and neck surgery and radiation therapy could be alleviated, minimized, or even eliminated altogether if there were appropriate planning for maxillofacial prosthetic and other dental interventions before treatment begins.

The strategy and techniques of rehabilitation of a head and neck cancer patient are directly related to the location of the cancer and to the extent and type of surgical intervention and radiation modalities used. Oral carcinomas not

detected and evaluated in their early clinical stages usually invade contiguous structures, thereby setting the stage for extensive surgical procedures that are generally followed by radiation therapy.

Removal of extensive segments of the tongue, floor of mouth, mandible, and hard and soft palate as well as the regional lymphatics usually mandates extensive rehabilitative management. Generally, maxillofacial prosthodonotists restore maxillary resections with obturator prostheses. However, in many instances a soft palate speech bulb-obturator retained in the maxillae (for restoration of velopharyngeal function) or a palatal augmentation prosthesis (if tongue function is lost) is required for optimal rehabilitation. Currently, rehabilitation of a maxillectomy and/or soft palate defect via an obturator prosthesis is most effective in restoring function. Recent advances in microsvascular free flap tissue transfers have been used successfully to reconstruct composite defects of the mandible, buccal mucosa, and tongue.

Current rehabilitative practice is centered in five principles: The process of rehabilitation begins at time of initial diagnosis and treatment planning.

1. The dentition should be preserved if possible.

2. Rehabilitative treatment plans should be based on fundamental principles of prosthodontics, including a philosophy of preventive dentistry and conservative restorative dentistry.

3. Surgery before prosthetic rehabilitation may be indicated to improve the existing anatomic configuration after ablative cancer surgery, reconstructive surgery, and/or radiation therapy.

4. Multidisciplinary cancer care is required to achieve the best functional, physical, and psychologic outcomes.

The need to treat tumors expediently often delays planning for rehabilitation. However, without a highly interactive and dynamic dialogue among health care providers during the initial treatment planning process, efforts to provide optimal rehabilitative care are impaired. Other health professionals-including

social workers,
vocational rehabilitation counselors,
nurses, nutritionists,
occupational therapists,
physical therapists,
speech pathologists, and

dental hygienists-are also vital members of the team. Because a team of this breadth is not typically encountered in the community setting, comprehensive rehabilitation is best managed in a tertiary referral center or specialized cancer hospital.

Factors affecting the cancer surgical treatment plan for oral cancer patients include the following

- Prognosis and systemic status of patient;
- Potential size and site of defect;
- Potential nature of functional and/or cosmetic defect;
- Adjunctive therapy (e.g., chemotherapy or radiation) that may compromise the surgical result; and
- Anticipated changes to function and cosmesis, based on the cancer surgery and the availability, accessibility, and cost of rehabilitative procedures.

Planning for patients who need rehabilitation of the maxillofacial complex includes consideration of surgical defects associated with the maxilla, mandible, tongue, soft palate, and facial region, including the patient with a combined orofacial abnormality.

Specific abnormalities result directly from the extent and nature of cancer treatment as well as the patient's functional and psychological ability to respond to changes induced by therapy. Thus, rehabilitation may be directed to hypernasality, mastication and deglutition dysfunction, control of oral secretions, compromised interarch relations, speech deficits (tongue disarticulation), salivary gland dysfunction, and/or cosmetics.

In recent years there have been significant advances in some of the strategies for rehabilitating the oral cancer patient. These include fundamental qualitative improvements in biomaterials (including osseointegrated implants), microvascular free flap tissue transfers, and hyperbaric oxygen technology (by which gas highly concentrated in oxygen is delivered under increased pressure to patients).

Still, long-term success depends in large measure on effective follow-up protocols. The traditional idea that a patient's original maxillofacial prosthesis will adequately support his or her lifelong needs is no longer valid. The prosthesis needs ongoing evaluation, adjustment, and usually replacement over time. Most removable extraoral prostheses need to be remade every 2 to 3 years; removable intraoral maxillofacial prostheses require regular maintenance and generally need replacement every 5 to 7 years. In addition, the ongoing long-term sequelae of radiation therapy for head and neck cancer require the dentist to keep the periodontium in optimal condition. Furthermore, restorations of abutment teeth used to retain an intraoral maxillofacial prosthesis must be sound and noncarious, and implant prostheses in this population require extensive maintenance for optimal functional results.

The standard of care for patients receiving a palatal resection (maxillectomy, palatectomy and/or soft palate resection) includes three stages of maxillofacial prosthetic intervention.

1. Immediate placement of a surgical obturator prosthesis (inserted in the operating room, usually by the maxillofacial prosthodontist, at completion of surgery to separate the oral cavity from nasal cavities created by cancer surgery).

2. Placement of a provisional or interim postsurgical obturator prosthesis (inserted after the surgical obturator and packing is removed 7 days postoperatively, worn in the postoperative healing period).

3. Placement of a definitive postsurgical obturator prosthesis.

**OSSEOINTEGRATION**

Major technologic advances have occurred in recent years in osseointegration (the process by which natural bone attaches to the metal or ceramic component of an implant), thereby facilitating the use of dental implants. Branemark et al. have pioneered the modern-day use of this technology, in which implant materials capable of bearing forces produced during normal function interface both structurally and functionally with bone. Dental implants are now being used in both oral and extraoral settings and have significantly improved the restoration of both form and function to the oral and craniofacial region. Potentially, implant-borne prostheses can be used in the majority of intraoral and extraoral defects. However, in patients with intraoral

defects, the most useful implant sites usually are not within the radiation treatment volume. An emerging exception appears to be the case of fibula free flaps, where implants are used to restore segmentally resected mandibles prior to post-surgical radiation. For extraoral prostheses, bioadhesives have traditionally been used to enhance retention but they have considerable limitations. Indeed, patients and clinicians often become frustrated by the difficulty of achieving optimal effects with adhesives. Both experience and specialized education can improve the clinician's ability to provide these components of extraoral and intraoral rehabilitative care.

The characteristics of successful osseointegration include: (1) biocompatible implant materials; (2) non-traumatic, aseptic surgical procedures; (3) an initial healing period in which functional loading of forces is deferred; and (4) stress-reducing prosthodontic procedures. Patients should be selected with great care, and proper maintenance and follow-up are imperative. Successful osseointegration can permit the restoration of masticatory function following mandibular fibula free flap microvascular transfers. Osseointegration in the maxillary-resected patient and implant-retained facial prostheses have become acceptable in major cancer centers worldwide

## A. Emerging Trends

Rehabilitative practices for oral and maxillofacial surgery patients have made important advances during the past several decades. Relevant research on biomaterials has been transferred directly to the clinical setting; these materials permit effective functional and cosmetic management of many patients with facial and intraoral defects who would otherwise experience lifelong disfigurement and dysfunction. In addition, important advances in imaging modalities, adhesives, implant materials; bone grafting, microvascular free flap tissue transfers, and hyperbaric oxygen have collectively enhanced rehabilitation outcomes. Still, these new modalities require outcome assessments to measure their effects on patient rehabilitation.

Future clinical and laboratory research on the use of osseointegrated implants and other prostheses in the presence of irradiated bone is expected to continue to refine the selection criteria for patients. Although the concern about osteoradionecrosis as a theoretic risk in such settings is real, risk is minimal in the maxilla, even in segments receiving more than 6,000 cGy. Even in the mandible, the prime implant site (symphysis) is not usually included in the high-dose field; if it is included, the dose is generally limited in the setting of field size reductions or use of brachytherapy.

A history of high-dose radiation to oral bone does not per se eliminate prosthetic placement of osseoimplants at irradiated sites. Patients who have

previously undergone head and neck irradiation still may be candidates for osseointegrated implants. The most likely limiting factors appear to be the ability to maintain viable appositional bone associated with the implant and the problem of the patient with a poor prognosis for tumor control. Selection of patients for osseointegrated systems must be based on careful consideration of their biologic and psychologic status. Because long-term, comprehensive monitoring of patient status is essential, the patient must commit to periodic comprehensive oral evaluations.

Both basic research and clinical experimentation with osseointegrated implants in irradiated bone must be priorities. In addition, planning for the future must include training adequate numbers of experienced professionals to meet the growing need for osseointegrated systems. It is important that educational training programs include the use of osseoimplants in irradiated bone to meet the evolving needs of the head and neck cancer patient.

Strategies for improving the rehabilitation of the oral cancer patient and reducing the volume of rehabilitative services needed include addressing risk behavior and detecting oral malignancies early. Opportunities exist to do the following:

- Enhance primary cancer management by adding new radiation protocols, using combined modality therapy, and reducing acute or chronic injury to normal, contiguous tissues

- Continue to foster research related to the complete rehabilitation of the patient, including investigations on reconstructive techniques, timing of the rehabilitation process, implants, and prostheses;

- Enhance professional education at the predoctoral and postdoctoral levels, so that the gold standard of multidisciplinary management becomes available to more patients; and

- Establish graduate training programs that combine traditional specialties for more comprehensive rehabilitation of the head and neck cancer patient, e.g., maxillofacial prosthetics and clinical oral medicine.

- Limited technology and standards of care to protect normal tissues while maximizing direct exposure of the tumor to cytoreductive interventions.

- .Limited national fiscal resources to extend reimbursement coverage for rehabilitative care; prevailing trends are to maintain or even reduce the scope of current reimbursement.

- Inadequate exposure to oncology principles in undergraduate dental and medical school curricula.

.**Considerations for the research agenda include the following:**

- Improved radiation delivery systems that protect an increased percentage of normal oral hard and soft tissues Topical or systemic interventions to protect normal tissues or enhance healing of damaged tissues;

- Improved technology for the placement of prostheses, including osseointegration in previously irradiated tissues;

- Improved prevention and management of osteoradionecrosis, including enhanced hyperbaric oxygen therapy protocols or new, superior modalities that promote angiogenesis and neovascularization;

- Health services research on the cost-effectiveness of current and emerging interventions; and

- Oral function assessment designed to determine which strategies are most effective in rehabilitation and medically necessary dentistry.

# REHABILITATION OF SWALLOWING AND SPEECH IN HEAD AND NECK SURGERY

## INTRODUCTION

The interrelated management of swallowing and speech disorders in patients with head and neck cancer dates back to more than 100 years ago when the first reported laryngectomy by Billroth and Gussenbuer in 1874 also included a report of fitting a patient with a pneumatic artificial larynx that introduced sound into the pharynx through a surgically created fistula. The fistula aided the patient in communication, and it also reduced the propelling force associated with swallowing. Since that time, attention to swallowing and communication skills has increased dramatically with the advent of numerous surgical procedures to preserve voice and speech in patients after treatment of cancer of the head and neck.

The management of dysphagia began its modern era only recently in 1983 with publication of Logemann's text on the evaluation and treatment of swallowing disorders. Logemann outlined the rationale for fluoroscopic assessment of swallowing disorders and the protocol for identifying the disordered phases of swallowing. This functional evaluation using the modified barium swallow (MBS) assessment protocol is rotted in the early work of Barelay, who in 1930 reported on the use of fluoroscopy to identify normal swallowing behavior. Many current surgical procedures as well as non surgical

therapies, including radiation and combined chemoradiation, used in the management of patients with cancer of the head and neck disrupt the natural swallowing patterns or compound already existing problems of swallowing caused by the disease process. Moreover, these oncologic procedures contribute to voice changes such as hoarseness and weak voice, altered resonance, and disorders of speech articulation.

The oral cavity, pharynx, and larynx share the functions of channeling expiratory air flow and voice upward and outward and propelling food, liquids, and medications downward into the esophagus and stomach. Because of this shared passage, the speech-language pathologist (SLP) who is uniquely trained in the anatomy, physiology, and neurology of the head, neck, and upper aerodigestive tract is the ideal person to coordinate the preoperative and postoperative rehabilitation of voice, speech, and swallowing for patients with head and neck cancer. The Head and neck Surgeon and the SLP maintain a close relationship during the rehabilitation period.

Measures of treatment efficacy and treatment effectiveness have shown that comprehensive management that begins before curative treatment maximizes recovery of swallowing function and improves quality of life following treatment for patients with cancer of the head and neck.

Flexible laryngoscopy allows examination of the anatomy of the pharynx and larynx during quiet and forced respiration, coughing, speaking, and

swallowing. Symmetry, coordination, and range of movement of the base of tongue and pharyngeal walls should be noted as the endoscope is passed. Pooling of secretions or food residue in the vallecula or pyriform sinuses should also be noted. The laryngeal closure reflex may be tested by gently touching the epiglottis or aryepiglottic folds with the tip of the endoscope. This maneuver requires some experience in that the examiner should avoid eliciting a gag reflex or laryngospasm. This test is often deferred until the endoscopic examination and swallow assessment have been completed. Sensation of the vallecula and lateral pharyngeal walls also can be tested with this technique. Alternatively, more objective measures of the laryngeal closure reflex and the sensory function of the upper aerodigestive tract can be obtained with the use of a flexible flberoptic laryngoscope with sensory testing capability described. This test uses a specially designed instrument to deliver a pulse of air to the aryepiglottic fold or vocal fold and measures the threshold of response to the air pulse.

**FUNCTIONAL EVALUATION**

Although clinical assessment may identify some patients with swallowing disorders, it has been shown that clinical assessment is not highly predictive of aspiration. A complete assessment of swallowing includes one or more instrumental tests following the bedside clinical assessment. Functional tests of swallowing such as fiberoptic endoscopic evaluation of swallowing, (FEES), modified barium swallow (MBS), and scintigraphy, provide specific information

regarding aspiration and focus on the physiologic aspects of the total swallow behavior. MBS and FEES provide diagnostic information because they assess the swallowing of the patient under a variety of circumstances, employing boluses with different consistencies and varying positions of the neck. These tests assist the clinician in planning a therapeutic protocol and identifying compensatory maneuvers, as well as in designing diet modifications to be used in the treatment of the swallowing disorders.

## BEDSIDE CLINICAL EVALUATION

A bedside evaluation is usually performed by an SLP experienced in the diagnosis and management of swallowing disorders. Interpretation of the oral motor examination, assessment of cognitive status, and observations of actual swallows constitute the clinical experience. Rarely is the bedside swallow assessment the final procedure for determining if a patient can safely begin oral nutrition. Rather, it should be considered the first step in advancing the patient to oral nutrition.

### MODIFIED BARIUM SWALLOW

The MBS is a multidisciplinary evaluation of the swallowing mechanism, usually performed by a radiologist in collaboration with the SLP. Candidates for a MBS include those patients presenting with dysphagia who have had a normal barium esophagogram, those with postoperative swallowing (following head and neck oncologic surgery).

MBS is the best way to evaluate the oral phase and the entire pharyngeal phase of swallowing. It provides detailed analysis of the coordination and timing of swallowing. Events that may cause dysphagia include abnormal movements of the tongue in forming the bolus and initiating deglutition, pooling of residual barium in the valleculae or pyriform sinuses, and aspiration of barium into the airway. MBS also provides information about the function of the upper esophageal sphincter.

Under fluoroscopic observation controlled by the radiologist, the patient ingests barium of varying consistencies under the direction of the SLP. The consistency of the barium is chosen to approximate the consistencies of food that a patient is likely to encounter in his or her daily diet. The initial consistency may be guided by the bedside evaluation. Pre selected barium consistency as well as normal food coated with barium can be prepared to better approximate a normal meal.

Frontal and lateral views are obtained during the MBS with the patient standing or sitting. Unlike the barium swallow, the MBS is purely dynamic; thus, it is recorded on videotape for review and may be used for patient education.

Entry of barium into the airway may be the most important information that the MBS can provide. The extent of aspiration, including the amount or percentage of bolus, and the most distal level of entry should be defined clearly.

The terms aspiration and penetration are not standardized. To complicate matters further, the terms glottic penetration and laryngeal penetration have also been used. Therefore, it is preferable that the location of the barium that extends farthest into the airway (i.e., subglottic, glottic, trachea, bronchi, lungs) be described. This may be as subtle as a coating of the laryngeal surface of the epiglottis or as obvious as gross inspiration of the barium into the lower trachea-bronchial tree. As with the traditional barium swallow, reflux of barium into the nasopharynx should also be documented.

Observer should also note the patient's response to the aspiration such as coughing or clearing of the throat, and the degree to which the barium is cleared out of the airway. "Silent" aspiration is defined as aspiration that fails to elicit a normal cough response. Silent aspiration cannot be detected during a clinical (bedside) swallowing examination, but it is readily apparent on the MBS. Abnormal motion of the epiglottis, diminished contractions of the pharyngeal constrictor muscles, and abnormal laryngeal elevation can all be identified on the MBS.

## FIBEROPTIC ENDOSCOPIC EVALUATION OF SWALLOWING

The assessment of swallowing using FEES requires the passage of a flexible fiberoptic endoscope into the nares and over the velum to a position above the epiglotis.[43] Topical anesthesia is applied with the use of cotton-tipped applicators to avoid anesthetizing the pharynx. Velopalatine anatomy and

function can be evaluated before the endoscope is passed into the oropharynx. Before liquid or food is offered to the patient, the examiner notes the anatomic structures and observes the functions of the velum (sustained phonation, repeating “coca-cola”), epiglottis, and larynx. After several “dry swallows” have been evaluated, specific amounts of liquids and varying food consistencies treated with food dye are viewed as they pass the pharynx and larynx. The quantity of retained secretions present in the vallecula and hypopharynx is also noted. Pharyngeal and laryngeal functions should be documented with different consistencies and amounts of bolus, along with various changes of the position of the head. The supraglottic swallow and chin tuck strategies may also be used to identify the possible causes of dysphagia. During the time of airway closure, the swallow cannot be visualized because the pharyngeal walls contract over the bolus, collapsing the lumen over the endoscope

Monitoring of the bolus is possible only before and after the pharyngeal swallow. However, the bolus can be monitored as it enters into view from the oral cavity to the pharynx. The speed of the pharyngeal swallow, premature flow of food or liquid into the pharynx and larynx, and residual amounts of the bolus can all be visualized during this examination. Unlike with the MBS, the endoscope may remain in place for long periods of time, allowing the clinician to monitor the residual bolus and examine anatomic structures. Swallowing with the use of compensatory strategies and changes in neck position is easily accomplished while the endoscope is in place. FEES are more sensitive than

MBS in detecting pooling of oropharyngeal secretions and subtle abnormalities of the palate, pharynx, and larynx; it provides better anatomic information. It does not assess the oral phase and does not evaluate the upper esophageal sphincter or the esophageal phase of swallowing.

FEES may be particularly useful when a patient cannot be easily transported to a radiology unit, has a significant voice quality change, or has limited ability to follow directions.

A FEES may not be indicated for patients with extreme movement disorders, those who cannot tolerate the endoscope, and those who have a history of bronchospasm or laryngospasm.

**FEES-ST**

Fiberoptic endoscopic evaluation of swallowing with sensory testing (FEES-ST) employs the standard FEES testing with the addition of sensory testing of the supraglottic mucosa to determine the presence of a sensory dysfunction in patients with dysphagia. For this test, an air pulse generator is used to send a pulse of air through a port in a specially designed flexible endoscope. Air pulses can be delivered to the supraglottic larynx and the hypopharynx. Sensory thresholds can then be determined by means of psychophysical testing methods.

## SCINTIGRAPHY

Scintigraphy is typically performed in the nuclear medicine suite by trained personnel. When used to track movement of the bolus and to quantify the residual bolus in the orophyarynx, pharynx, larynx, and trachea, this test is done by having the patient swallow a small amount of a radionuclide material (such as technetium 99m) combined with liquid or food. A special camera (gamma camera) records images of the organs of interest over time to reveal a quantitative image of the transit along with metabolic aspects.

Because there is no time limit for this testing, scintigraphy can be used to identify trace aspiration and to quantify the aspiration over short or long time periods (e.g., delayed “postprandial” or “reflux aspiration”). Scintigraphy can also be used to calculate the transit time and residual pooling of a bolus in patients suffering degenerative neuromuscular disease, both before and after treatment. Perhaps the strongest indication for the use of scintigraphy is in identifying those patients with reflux aspiration and those patients who, despite limited aspiration, have the ability to clear the aspirate quickly, as well as those in whom the aspirate does not reach the distal airways-this revealing a subset of patients who may be fed by mouth.

Despite its objective quantitative analysis of aspiration, scintigraphy does not provide an adequate definition of the anatomy of the upper aerodigestive

tract. Scintigraphy is also more costly than videofluorography or FEES. For these reasons, it is not sued routinely.

## MAGNETIC RESONANCE IMAGING

High-speed magnetic resonance imaging (MRI), such as fast low-angle shot (FAST) or echoplanar imaging, has allowed a dynamic analysis of the pharyngeal phase of swallowing that was impossible with the use of conventional MRI. The pharynx, oral cavity, laryngeal lumen, and musculature can be evaluated during motion, allowing assessment of the swallowing mechanism.

During a FAST MRI, intravenous contrast is injected into the patient and the patient is given an oral contrast containing ferric ammonium sulfate as a food bolus substitute. Images are obtained as the bolus is moved from the oral cavity to the esophagus. This technique however, can assess the activity of the oral cavity and pharynx only during short periods of time.

MRI has the advantage of not exposing the patient to radiation. However, the temporal and spatial resolution of MRI is inferior to that with videofluoroscopy; thus, images with poor resolution are produced. MRI is costly, and swallowing in the supine position may not reflect the true physiologic mechanism of swallowing.

## MANAGEMENT OF SWALLOWING DISORDERS

Preoperative treatment information may predict the severity and duration of post-treatment dysfunction. Moreover, speech and voice disorders before surgery, radiation, or chemoradiation should also be documented so that realistic post-treatment communication expectations can be outlined and swallowing exercises that may help to prevent long-term disability can be initiated.

### Surgical Treatment

The goals of surgical treatment are to enhance the compensatory mechanisms of the unaffected side and to improve the sphincteric function of the swallowing mechanism. In extreme cases, the surgery may be of a palliative nature and may separate the trachea from the esophagus to stop aspiration.

### Rehabilitation

Rehabilitation of patients with cancer of the head and neck requires a multidisciplinary team approach that includes the surgeon, medical oncologist, radiation oncologist, maxillofacial prosthodontist, SLP, physical therapist, and oncology nurse. The rehabilitation team coordinates treatment from the time of diagnosis to the completion of rehabilitation by way of tumor board meetings, planning conferences, and patient/family conferences. The SLP is a vital member of the team and is responsible for the evaluation, recommendations, and treatment of speech and swallowing disorders that are encountered in patients

diagnosed with cancer of the head and neck. The goals of the SLP are to educate patients about their disorders, identify the safest diet, teach techniques to prevent aspiration, increase speech intelligibility, monitor progress during different phases of treatment, and report results of treatments to the management team.

To manage patients effectively, the SLP who has specialized training in speech and swallowing disorders must understand the critical components of the disease, type of and its impairments, reconstructive procedures and its effectiveness and how the disease affects communication and swallowing. The size, location, and extent of tumor must be identified so that possible treatments can be planned because each of these parameters directly affects speech and swallowing. The effects of radiotherapy, including xerostomia, mucositis, and tissue fibrosis, must be considered because they negatively affect swallowing and may also cause changes in the voice. These issues must be addressed before the time of treatment and during the short-and long-term follow-up stages.

The reconstructive technique used following resection of the tumor also affects swallowing function. Techniques using primary closure or split-thickness skin grafts tend to minimize dysphagia and speech impairaments compared with reconstructive procedures that introduce tissue from other parts of the body.. The lack of adequate blood supply and nerve function usually limits motion as well as decreases sensation and thus increases the possibility of poor oral, pharyngeal, or laryngeal control of secretions.

Each of these issues, as well as the need for assistance in the management of patients' environmental and social issues, underscores the need for a well-trained SLP to be integrated into the head and neck team. The team must be aware that goals for speech and swallowing change during the different phases of treatment and that the timing of an intervention may affect the outcome. For some patients with small lesions, speech and swallowing goals are met relatively early following primary treatment; for others (e.g., those with extended supraglottic laryngectomy), extensive rehabilitation may take 6 months or longer Unfortunately, in some cases, patients do not recover normal swallow function and may need additional surgery to manage aspiration or may require a permanent feeding tube to meet nutritional needs. Others with permanent speech disability, such as those who have undergone total glossectomy, may require additional non oral communication devices.

**Anterior / Lateral Tongue Resection**

Resection of lesions of the tongue often disrupts manipulation and transfer of the bolus. The severity depends on the extent of resection, the mobility of the residual portion, and the type of reconstruction. The lack of lingual propulsion reduces swallowing efficiency in foods with higher viscosities In a recent study by Furia and coworkers, patients who underwent a partial glossectomy exhibited an increase in oral transit time for paste foods, stasis in

the oral cavity, a reduction of anteroposterior propulsion of the tongue, and an increase in the number of deglutitions to clear the valleculae

The degree of surgical resection has a significant effect on the degree and duration of swallowing dsyfunction. Patients with less than 50% resection of the tongue usually have temporary swallowing problems Patients with greater than 50% resection experience more severe effects, such as decreased lingual propulsion and inadequate contact of the remaining tongue with the palate. With these patents, palatal augmentation with a palatal drop prosthesis may be required to reduce the volume in the oral cavity and to provide greater lingual contact with the palate.

Resection of lesions in the anterior oral cavity does not affect the pharyngeal stage of swallowing; however, if resection includes portions of the lateral pharyngeal wall, initiation of the pharyngeal swallow is delayed and weakened pharyngeal peristalsis causes residue that is often aspirated after the swallow is completed. Rehabilitation efforts begin with the choice of safest consistency for oral feedings. During the postoperative stage, most patients benefit from lover-viscosity food choices such as skim milk, Patients are taught maneuvers that will assist with bolus transfer. Range-of-motion exercises are practiced to achieve maximum movement from the remaining tongue.

## Total Glossectomy

The tongue is a dynamic organ that is involved in the oral preparatory phase, the oral phase, and the beginning of the pharyngeal phase of swallowing. When patients undergo total glossectomy, all three phases of swallowing are affected.

## Anterior Floor Of The Mouth

Resection of the anterior floor of the mouth creates oral dysphagia because of impaired range of motion of the tongue. Postoperative edema prevents adequate manipulation of the bolus and transfer of certain consistencies. Patients are taught to place the bolus posteriorly in the oral cavity to improve oral transit time. Postoperatively, foods may be restricted to a consistency that flows. Thin liquids can be easily aspirated before the swallow owing to loss of oral control; therefore, thickened liquids are usually the best choice for patients after this type of surgery.

## Communication Following Head and Neck Surgery

Following surgery to one or more organs of the head or neck, communication may be impaired owing to problems of articulatior, resonance or voice. Articulation and resonance disorders arise from structural changes to the lips, tongue, palate, mandible, maxilla and velum, nasopharynx, and sinonasal

cavities. Voice disorders result from anatomic and/or physiologic changes to the larynx and vocal folds.

**Oral Cavity Cancer**

The communication problems associated with oral cavity cancer depend on the type and extent of treatment. Non-surgical management of oral cancer usually results in only minor impairments to articulation and little effect on over-all speech intelligibility. Pauloski and coworkers found that the effects of radiation therapy on speech are less severe than on swallowing Tissue changes that lead to fibrosis may limit speed of movement and lingual, labial, and/or mandibular strength, as well as range of notion. Resultant speech limitations include articulatory imprecision and sound substitutions. with extensive speaking rate of speech may be reduced and can become labored, thus interfering with the naturalness of speech.

Treatment may improve articulation and speech intelligibility. Logemann and associates demonstrated improved speech intelligibility with the use of range-or-motion exercises following oral and oropharyngeal tumor resection. Treatment is more likely to be successful if it is started early, and it produces little change if it is started longer than 1 year after surgery or radiation.

Prosthetic management improves speech and articulation following surgical resection. Prosthetic management of soft palate defects is directed to

separate oral and nasal cavities, increasing intraoral pressure and creating contact points for the tongue to improve precision of articulation. This results also in reduced nasal speech.

Hard palate defects treated prosthetically result in immediate separation of oral and nasal cavities, thus allowing for increased intraoral pressure and a greater number of contact points for the tongue.

**Tongue Defects**

Total glossectomy is a severe detriment to speech production. The tongue is responsible for articulation of more than two thirds of the English language. The patient with a total glossectomy can be treated with a mandibular tongue prosthesis. The success of tongue rehabilitation depends on the presence of teeth to anchor the prosthesis. With proper dentition, the prosthesis can be anchored, and sounds such as/t, d, k, g, p, b/ can be articulated with improved precision. Leonard and Gillis reported significant improvement in both speech and swallowing when a prosthetic tongue was fitted properly in patients with total glossectomy

Partial glossectomy reconstruction consists of palatal augmentation or mandibular augmentation. The augmentation prosthesis fills the void created by surgical excision.

# SUMMARY

The management of dysphagia at the outset of the diagnosis of oral cancer has been shown to be unequivocally significant in the recovery process. Swallowing disorders are anticipated when key anatomic structures are removed or treated with radiation and/or chemotherapy. The critical valve-the vocal folds-provides the necessary protection against aspiration; therefore, examination of the larynx and vocal folds is an essential aspect of management of patients with head and neck tumors, as well as those with swallowing difficulty after a cerebrovascular accident or surgery that may lead to high vagal lesions.

The otolaryngologist and the SLP are the key managers of swallowing disorders. Surgical and non surgical methods or rehabilitation provide the patient with improved swallow function and enhanced quality of life and speed the recovery process. There is a growing body of evidence to support the need for short-term as well as long-term management of swallowing disorders caused by anatomic changes, tissue changes, such as fibrosis long after radiotherapy and surgery.

# Quality of Life in patients After Oral Resection

## Introduction

Why study quality of life (QOL) in head and neck cancer? Perhaps the dominant impetus is the disquieting truth that, when the traditional endpoints of survival and locoregional control are used, in many instances a significant difference between treatment options cannot be identified. Additionally, some studies support the contention that QOL of patients undergoing treatment for head and neck cancer is worse than that of patients with more common cancers. It is thus important to understand the conceptual foundations related to QOL measures so that they may be properly applied both in selection of treatment and in design of new clinical trials.

Head and neck cancer and its treatment affect some of the most fundamental functions of life, including eating, communication, and social interaction. Treatment may consist of surgery, radiation, and/or chemotherapy and is often functionally and cosmetically devastating. Facial disfigurement, speech impediment, difficulty with swallowing and chewing, loss of taste, and shoulder pain are common consequences of treatment. These disabilities can alter self-esteem, limit activity and employment, and decrease social interaction with family and friends.

Disease-free survival, overall survival, and tumor response rates are the traditional outcome measures that have been used to judge the efficacy of

treatment. Patients with stage I or II cancer of the head and neck generally have an 80% to 90% cure rate with minimal morbidity when managed by single-modality surgical treatment. However, 5-year survival rates for patients with stage III and IV head and neck cancer are generally poor. Whether treatment is palliative or curative, the disability associated with treatment for advanced cancer often seems worse to the patient than the untreated cancer. For example, in his series of patients with stage IV head and neck cancer treated with curative or palliative intent, Burns reported that 42% of patients believed that ‘there was virtually no joy in life after treatment.” Gamba in his series of 66 patients treated surgically for advanced cancer of the head and neck without evidence of disease found that 18% of his subjects believed the disadvantages outweighed the advantages and that 30% believed the post-treatment difficulties were “too harsh”. In other words, the traditional outcome measures of treatment efficacy, such as tumor recurrence and survival time, are often meaningless to the patient. What matters is his or her ability to return to pre-illness function and psychosocial well-being.

Quality of life is the term used to describe the nontraditional outcome measures of functional status and psychosocial well-being. Especially in oncology, incorporation of QOL outcome measures to supplement standard clinical trial endpoints has recently increased. QOL endpoints and assessment have been used in clinical trials for advanced colorectal cancer. Hodgkin’s disease, advanced ovarian cancer, lung cancer, and chronic medical conditions

such as hypertension, diabetes, and coronary artery disease. Furthermore, to promote the use of QOL outcome measures both the National Institutes of Health and the National Cancer Institute sponsored workshops on QOL assessment in 1990, including the recent conference on “Measuring and Reporting Quality of Life in Head and Neck Cancer”, sponsored by the National Institutes of Health, held in McLean, Virginia, in October 2002. This conference attracted an international audience representing quality of life researchers from 20 countries.

QOL research is not lacking in the head and neck literature. A number of articles provide reviews of previous QOL studies and highlight the need for further QOL research. Particularly helpful general reviews are the contributions from Ringash and Bezjak and Long and associates. Head and neck cancer QOL research has primarily consisted of descriptive, retrospective studies. However, this situation is changing. In 1993, Browman and colleagues used a QOL instrument to measure acute morbidity due to radio-therapy in a prospective, randomized study of concurrent 5-fluorouracil (5-FU) and radiotherapy in the treatment of advanced head and neck cancer. Moreover, over the past few years, a number of general head and neck QOL questionnaires have been validated. Preliminary results indicate that these questionnaires are responsive to clinical change and could be incorporated into clinical trials.

**Defining the concept and the content of quality of life**

QOL is a multidimensional construct without a universally accepted definition. Ferrans and Powers define QOL as a “person”s sense of well-being that stems from satisfaction or dissatisfaction with the areas of his life that are important to him. According to Cella, QOL is a “patient’s appraisal of and satisfaction with current level of functioning as compared to what they perceive to be possible or ideal. Crucial to any definition is the recognition that different people have different values that cause aspects of their lives to have different impacts on their QOL. For example, a disease or treatment that would interfere with an individual’s ability to work or to be active would have a more profound impact on the QOL of an individual who was employed and enjoyed exercising regularly than on the QOL of an individual who was retired and led a relatively sedentary life. It is also conceptually important to acknowledge that individual QOL varies over time according to a wide variety of extrinsic and intrinsic factors.

To gain the advantages of both types of measures, investigators have recently synthesized both approaches into one measurement strategy, called a modular approach to QOL assessment. IN this approach, a set of core disease-specific questions is supplemented by a set of site-or treatment-specific questions. The Functional Assessment of Cancer Therapy (FACT) and European Organization for Research and Treatment of Cancer (EORTC) scales are

examples of the modular approach. These instruments have a core cancer QOL measure with modules for different types of cancer, such as breast, lung, and head and neck cancer. General health questionnaires can be used concurrently with the core and modular questionnaires to obtain additional QOL information. As has been noted by Osaba, there is ample evidence "that some multidimensional measures of HQL (health-related QOL) may be more accurate predictors of survival than either KPS (Karnofsky Performance Status) or the Eastern Cooperative Oncology Group (ECOG) performance status. If this is true, a disease-specific head and neck QOL assessment could be an important stratification variable for prospective randomized trials in head and neck cancer.

**Head and Neck-Specific Questionnaires**

Many head and neck QOL questionnaires have been developed for use across the broad spectrum of head and neck cancers:

- **List's Performance Status Scale for Head and Neck Cancer Patients,**
- **The EORTC Core QOL Questionnaire with a Head and Neck Module,**
- **The University of Washington (UW) QOL Questionnaire,**
- **Cella's FACT Scale with a Head and Neck Module, and**

- **The University of Michigan Head and Neck Specific QOL Instrument are among these.**

List's Performance Status Scale for Head and Neck Cancer Patients. List's Performance Status Scale is a clinician -rated tool for measuring the unique disabilities of head and neck cancer patients in the areas of eating and speaking Patients receive a functional rating score in three subscales-eating in public, understandability of speech, and normalcy of diet. In each subscale, a list of items is arranged in a hierarchy, with normal function and total incapacitation receiving scores of 100 and 0, respectively. Reliability and validity were demonstrated in 181 patients with cancer of the head and neck, representing a range of diagnoses such as cancer of the oral cavity, pharynx, larynx, and other head and neck sites. Furthermore, when these patients were divided into four groups based on the extent of their surgery (wide local excision, partial laryngectomy, total laryngectomy, and flap reconstruction), significant group differences were found in all three performance subscales.

EORTC Core-QOL Questionnaire with a Head and Neck Module. A disease-specific module for cancer of the head and neck to supplement the QLQ-C30 has recently been validated. The module consists of 21 items measuring disease-related symptoms and treatment-related adverse effects. These items include questions concerning problems with tasting, swallowing, talking, producing saliva and mucus, and breathing through the nose. The module was

completed by 126 patients. Thirty-three percent of patients had cancer in the oral cavity, 13% in the pharynx, 19% in the larynx, 18% in the skin, and the remaining 18% in the salivary glands, paranasal sinuses, thyroid gland, or cervical lymph nodes without a known primary. The EORTC QLQ-C30 with a head and neck module was found to discriminate between groups of patients before, during, and after treatment with radiation, and between acute, sub acute, and late disease - and treatment - related symptoms and toxicity. For example, problems with soreness in the mouth, swallowing, and salivation/mucus production were worst halfway through the radiation course, while change in taste was greatest immediately after treatment completion. The questionnaire's high acceptance and compliance rates among patients add to its utility as a practical QOL instrument.

Before the publication of the EORTC head and neck module, Jones and associates developed a head and neck QOL questionnaire based on the EORTC core questionnaire to which a specific head and neck module had been added. In the questionnaire, 14 questions specific to cancer of the head and neck were scored on an interval from 0 to 3. Responses to each question ranged from "not at all" to "very much." In Jones' study, 48 patients who had under-gone surgical treatment for cancer of the head and neck completed the questionnaire (a response rate of 98%). For analysis, the patients were divided into five groups: laryngectomy (25), craniofacial procedure (11), pharyngo-laryngoesophagectomy (5), "other operation" (4 patients who underwent a

hemiglossectomy, 3 tonsillectomy, and 2 thyroidectomy), and patients with clinical recurrence. In each group, different problem areas were identified. Laryngectomy patients reported speech difficulties and hyposmia. Craniofacial patients described visual problems, headaches, and a diminished sense of taste and smell. Pharyngolaryngoesophagectomy patients described eating and speech-related problems. Patients with recurrence reported problems with speech. Self-consciousness, smell, taste, and eating. In Jones opinion, the results indicate that additional studies should use the EORTC questionnaire to increase the clinician's understanding of functional problems, which in turn would aid rehabilitation efforts.

**UW QOL Questionnaire.** The UW QOL questionnaire was designed to be specific for head and neck patients. It is patient-administered and generally can be completed in less than 5 minutes. The scale comprises 10 categories, each of which describes important daily living dysfunctions or limitations about which patients complain, that result from cancer of the head and neck or its treatment effects. Each of the nine categories includes several options that allow the patient to describe his or her own current functional status.

The highest level, or "normal" function, is assigned 100 points, whereas the lowest level, or greatest dysfunction, is scored 0 points. Each category contributes equally to the final score of the questionnaire of 1000 points. This questionnaire was administered to 75 head and neck cancer patients on three

separate to 75 head and neck cancer patients on three separate occasions: (1) several days preoperatively, (2) immediately postoperatively, (3) and 3 months postoperatively. Patients were grouped according to their clinical stage (T1, T2, T3, or T4). The questionnaire was found to be sensitive enough to detect not only the expected large differences in QOL for T3 - and T4- stage cancer patients after treatment, but also the more subtle changes that may occur in T1-T2-stage patients.

The UW QOL instrument was further assessed for internal consistency with the use of data collected from 550 patients. Based on this analysis, the domains have been modified to eliminate “employment” and “dryness,” and. a global QOL inquiry has been added.

Recently, Rogers and colleagues analyzed the addition of two questions regarding mood and anxiety. Their results indicate that the addition of these two questions has strengthened the UW QOL instrument by providing previously absent probes in the psychosocial realm.

**Quality of life assessment in head and neck cancer**

Two types of QOL studies have been done in cancer of the head and neck-those that report assessment strategies and QOL instruments and those that document QOL in specific patient populations. The Purpose of QOL research in head and neck cancer has been threefold: (1) to use QOL as an outcome measure

of treatment, (2) to assess the rehabilitation needs of patients, and (3) to determine the pretreatment QOL of patients so that QOL can be used as a predictor of prognosis. Site-specific and treatment-specific QOL questions account for the majority of QOL research in head and neck cancer. Particularly in cases where different treatments have nearly equivalent cure rates but different functional problems, questions of QOL have been raised to guide the selection of treatment. This particularly applies to treatment decisions for patients with cancer of the larynx.

Komisar published the first studies of the functional results of mandibular reconstruction for patients who had undergone composite resection of oropharyngeal cancer. In his 1990 series, seven patients underwent reconstruction with a metal plate and a free bone graft taken from the iliac crest. One patient underwent reconstruction with only a metal plate. In the reconstructed group, two patients also received myocutaneous flaps. In the group of eight patients who did not undergo mandibular reconstruction, seven received myocutaneous flaps for oral closure. The functions of deglutition, mastication, and cosmesis were compared between patients with and without reconstruction. There was no significant difference in deglutition. Mastication was worse and cosmesis was improved among the patients with reconstruction. Patients with reconstruction also had a greater number of hospitalizations secondary to complications from the reconstructive procedure. Kosimar concluded that

aggressive surgical reconstruction of the mandible for lateral defects does little to improve the QOL of patients with oral pharyngeal cancer.

In 1991, Urken and colleagues demonstrated the functional advantages of free-tissue transfer in oromandibular reconstruction. using a number of tests to assess overall well-being, cosmesis, deglutition, oral competence, speech, length of hospitalization, masticatory function, and dental rehabilitation, Urken compared 10 patients who underwent one-state oromandibular reconstruction using the iliac crest-internal oblique free flap and dental rehabilitation with osseointegrated implants versus 10 patients with similar soft tissue and bone defects who underwent no bony reconstruction of the mandible. In the group of patients with non reconstructed mandibles, three required a pectoralis major flap for oral cavity reconstruction. One patient had reconstruction with a hemitongue flap. The defect in the remaining six patients was closed primarily. In almost all functional and psychosocial categories, patients who had undergone reconstruction had higher scores. The average length of hospitalization for patients with reconstruction (20.1 days) was not significantly higher than the length of hospitalization (19.7 days) for patients who had not under-gone reconstruction. In addition, patients with mandibular reconstruction achieved a functional level closer to that of their pre-disease state and were able to resume employment and social activities more frequently than patients who had not undergone reconstruction.

Urken's study represents the type of critical analysis of post-treatment function that is necessary for the evaluation of surgical therapy. Without such analysis, treatment decisions are based on the surgeon's preference.

Thus, the present and future challenge of head and neck research is to work toward the routine inclusion of QOL outcome measures in clinical trials. QOL might prove to be the most sensitive and powerful measure of treatment efficacy.

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